Crops Committee Recommendations for a Guidance Document Relative to Hydroponics and Other Soil-less Growing Systems:

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Background

In 1995, the NOSB stated that hydroponic production systems could possibly be conducted as organic operations as long as these systems met the other requirements of the national standards. The NOP's current position is that hydroponic systems are already covered by the existing rule (as has been stated by current program leader Mr. Richard Mathews). At the October, 2002 NOSB meeting, the board recommended that producers of spirillina be allowed to use Chilean nitrate as the sole source of nitrogen in their systems until October, 2005. However, neither the tap review or the NOSB's decision addressed the issue of whether or not this type of production system qualifies for organic certification.

Since hydroponic systems are already covered by the Final Rule, questions can arise as to what, if any systems actually qualify for organic certification by certifiers, and what yardsticks will certifiers use to make these determinations? Moreover, since so much of organic philosophy and production is built around establishing and maintaining healthy soils, how can soil-less systems be effectively evaluated using the organic standards found in the final rule? More importantly, can hydroponic systems qualify for organic certification?.

Types of Soil-less Systems

Hydroponic systems utilize fertilizers which are dissolved in solution. There are two basic types: liquid hydroponics and aggregrate hydroponics. Liquid systems include the nutrient film technique (NFT), aeroponics, floating raft and noncirculating water culture . The NFT system, which is commonly used in commercial hydroponics, involves a closed, recirculating system. Nutrient from organic sources are available for these systems such as solutions prepared from blood meal, rock phosphate, guano, etc. Aggregate systems involve media mixes in bags, troughs, trenches, or in benches systems. Some aggregate systems are also called drip or substrate systems. Common media include perlite or rock wool.

Questions to consider with "organic" hydroponic systems:

1. The over-riding question of whether soil-less systems are compatible with organic production (which is relevant to all of the systems discussed in this document).
2. Source of fertilizers:
3. Leaching problems with open systems
4. Source of media for aggregate systems
5. Composition of inert ingredients
6. Disposal of wastes

Aquacultural systems involve the production of aquatic plants and animals in somewhat controlled environments. The Aquatic Task Force provided recommendations for the production of most aquatic species of fish. However, the NOSB review of the petition involving the use of Chilean nitrate for spirilina production was assigned to the Crops Committee. Therefore, it is appropriate for the Crops Committee to consider the question of suitability of spirilina production for organic certification.

Questions to Consider (In addition to those cited above)

1. Over the long run, can the systems become more sustainable with less reliance on outside inputs?

Aquaponic systems combine the features of both hydroponics and aquaculture. This is done by recirculating the effluent from fish tanks and using it as a source of nutrients for vegetables grown hydroponically. Using sand or gravel as media. Nitrifying bacteria convert the fish effluent, primarily ammonia, to nitrite and then nitrate, which the plants can use. Diver (**Aquaponics-Integration of Hydroponics With Aquaculture**, *2000)* points out several sustainable aspects of aquaponic systems including the following:

- Waste materials from one biological systems are used as a source of food or fuel for a second system;
- The integration of the production of fish and plants increase diversity, and in turn, system sustainability;
- Biological filtration cleanses the water before it leaves the system; and
- It is possible that the only fertility input would be the fish feed.

Questions to consider:

1. Relevance of the source of fish feed (Can the vegetables be considered organic if the fish are not raised organically?).
2. Safety concerns and waiting period between fertigation with fish effluent and harvest of the crops.

Other Soil-less Systems:

Bag cultures involve the growing of crops in a soil-less media. They can be used within aggregrate hydroponic systems where liquid fertilizers are applied through the drip system. Media for the bags can include vermiculite, peat moss, rice hulls, and other mixes. In non- hydroponic bag cultures, compost is often added to the bag. Vertical towers are another form of bag culture in which long bags full of soil-less media are hung from beams or wires, and plants are grown through holes or slits in the sides of the bag.

Questions:

1. Should all soil-less bag culture systems be considered along with hydroponics, or only those involved in hydroponic production.?
2. What materials are found in the polyethylene bags that are used?

3. How is leaching prevented from the drainage holes in the bags to the greenhouse soil?

Straw bale cultures were used in the greenhouse much more frequently in the past, before the advent of the nutrient film technique and rock wool . Under this system, the greenhouse floor (which could be concrete, or lined with plastic) is covered with straw bales. The bales are normally wetted with compost tea mixtures to expedite heating and decomposition. The bales are then covered with a layer of compost. Organic fertilizers are then applied as topdressings to the bale, and plants can also be foliar-fed.

Shallow bed cultures are another form of soil-less culture in which a thin layer of compost is placed over a plastic woven weed barrier for the production of shallow-rooted herbs and vegetables.

Questions:

1. Should the shallow bed and straw bale cultures be more appropriately considered as soil-bearing cultures, since they both involve the addition of composts? This would also hold true for the bag cultures containing compost.
2. How is leaching of nutrients prevented to the areas surrounding the greenhouse?

Other General Considerations: (Assuming that at least some soil-less systems will be eligible for certification)

1. Several sources have noted an increase in economic feasibilty for hydroponic and aquaponic production. How many hydroponic/aquaponic producers are seeking or will be seeking organic certification?

2. Are current certifiers, many of whom have specialized in certification of soil-based systems, qualified to handle this type of certification? If not, how will they be bought up to speed?

Current Status:

Not many hydroponic systems exist world-wide that have obtained organic certification. There are a few operations that produce spirulina in Europe that have obtained organic certification. The United Kingdom does not permit organic certification for hydroponic operations. British Columbia and New Zealand also do not allow for certification of hydroponic production systems.

In the United States, opinions among certifying agents is divided. For example, California Certified of Organic Farmers can certify hydroponic operations if inputs approved for organic production are used while Oregon Tilth will not certify hydroponic systems.

Crops Committee Conclusions Regarding Hydroponics and Soil-less Cropping Systems:

In general, hydroponic production systems do not support the tenets of organic production systems and it is difficult to justify organic production systems in soil-less environments. Although the NOSB has endorsed the potential certification of aquatic systems through the adoption of the Aquatic Task Force, these systems involve species that are naturally aquatic. On the other hand, most crops that are commonly raised in hydroponic or soil-less systems are crops that are usually grown within soil-based systems.

Definitions of organic production systems often include some reference to the importance of healthy soils and sustainable soil management systems. The definition in the NOP Final Rule does not mention soil, but does state the importance of "integrating cultural, biological and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity". Often, hydroponic systems do not promote biodiversity, since they frequently utilize systems of monoculture. Also, resources are often not recycled, but instead there is an over-reliance on external fertilizer inputs. A possible exception to this would be systems that integrate fish and crop production while utilizing fish waste as a source of fertility. Another possible exception would be systems that utilize compost as a growing medium.

Finally, it is obvious that hydroponic systems generally can not satisfy Sections 205.203-205.206 that address matters concerning crop rotations, soil management, and other soil-related provisions.

The concerns raised above render moot many questions that can be raised concerning specific practices and inputs relative to the various hydroponic systems and soil-less systems, since most of these systems do not qualify for organic certification.

Recommendations:

Hydroponic and other soil-less systems for crop production are limited to the following categories:

1. Production of higher plants that are naturally aquatic species.
2. Production of algal organisms such as spirulina.
3. Production systems that utilize compost as a growing media.

In aquaponic systems that include fish and plant species, the plant component must also meet the above requirements. Certifiers must validate producer plans that insure that fish effluent is used in a manner that does not lead to a buildup of human pathogens on the crops that are produced.